A CBM Time-of-Flight outer wall layout *

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The key element providing hadron identification at incident energies between 2 and 10 AGeV is a Time-of-Flight (ToF) wall covering the polar angular range from 2.5 °-25° and full azimuth [1]. The ToF-wall is subdivided into different regions covered by different counters arranged in super modules (SM). A possible layout of the outer wall is presented in this report.

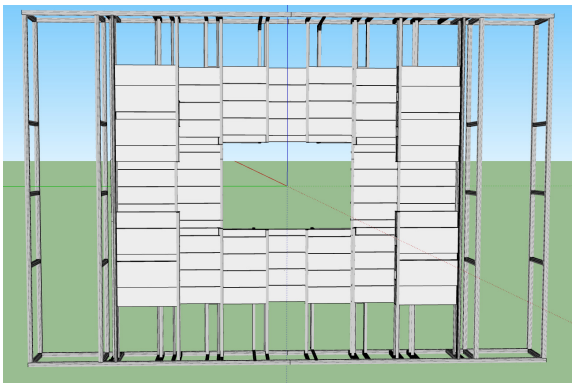

Figure 1: 3D drawing of the outer CBM ToF-wall as designed for the start version of CBM. For details see text.

Figure 1 shows a 3D drawing of the outer part of the ToF-wall, designed for the starting phase of CBM. In the start version of CBM it is planed to locate the wall 6 m downstream of the target. Upon completion of SIS 300 the wall will be extended and relocated to 10 m downstream from the interaction point demanding flexible positioning of the counter elements. The main frame (15 m × 10 m) is designed in such a way that it is usable for both positions which minimizes the cost for the upgrade substantially. The SMs are mounted on commercial bars made of aluminum profiles running in vertical direction which allow for shifting of the SM in this direction (see Fig. 1). The bars placed in front of the active detector material have a typical radiation length of about 6 %. The bars carrying most of the load are placed behind the active detector material. The outer wall is built from 2 types of super modules (SM) only:
1. small SM, size 1800 mm × 490 mm × 100 mm
2. big SM, size 1800 mm × 740 mm × 130 mm
Hence the cost for development and production is reduced. In addition the same size of the SM allows a better and more compact staggering in order to avoid holes in the acceptance. Both types of SM are constructed in the same way. The SM boxes are made out of aluminum. The counters mounted in the small chamber are staggered in two ways. For the central column of the wall the staggering of the RPC is done symmetrically in an alternative fashion. In the other columns the counters are tilted to the beam by an certain angle and overlapped like roof tiles. The preamplifier cards (see [2, 3]) carrying 2 PADI chips each are mounted inside the super modules directly to the readout electrode of the counter in order to improve shielding and thus stability. The discriminated signals are transmitted via twisted pair cable to a multilayer PCB acting as a feedthrough. The outer side of the PCB contains connectors where the TDC (GET4 or FPGA-TDC) can be plugged. A data collector board combining all TDCs is sending the data via glass fiber cable to a FPGA based pre-processing board. This solution decreases the amount of cables leaving the wall tremendously. The super modules are based on 2 types of counters only:
a) small RPC: 27 cm × 32 cm using low resistivity glass
b) large RPC: 53 cm × 52 cm using window glass
The dimensions of the active area of the counter modules are compatible with the production limitations of the respective glasses. In order to implement impedance matching with the FEE strip widths of about 7 - 8 mm, gap number between 8 and 9 and a gap width of 220 μm have to be used, fixing the strip number of the counters to 56 (32) for the large (small) modules, respectively. Some of the technical characteristics are summarized in Table 1. Further detailed information about the performance of the differential strip RPCs can be found in [4, 5]

Table 1: Technical characteristics of the super modules

	small SM	big SM
# of RPCs	5 small RPC	3 large RPC
# of strips	160	168
# of channels	320	336
# of FEE-cards	40	42
total active area	152 × 27 cm^2	152 × 53 cm^2
overlap to next SM	h.: 2 cm, v.: 2 cm	h.: 3 cm, v.: 2 cm

References

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